

01FN046US
Amendment dated 09/22/2003

09/916,529

02230028aa
Reply to office action mailed 06/23/2003

The following is a complete listing of all claims in the application, with an indication of the status of each:

Listing of claims:

- B1
Sub 03
Cont
- 1 1. (currently amended) A magneto-resistance effect element comprising:
2 a lower conductive layer;
3 a free layer provided on the lower conductive layer and having an
4 orientation of magnetization varied by a magnetic field applied thereto;
5 a non-magnetic layer provided on top of the free layer;
6 a fixed layer provided on the non-magnetic layer and having a pinned
7 orientation of magnetization; and
8 a vertical bias layer provided on said lower conductive layer, for
9 applying a magnetic field to said free layer, and said free layer is greater in
10 length in the direction of a magnetic field applied thereto by said vertical bias
11 layer than said fixed layer, and a sense current for detecting a change in
12 electrical resistance of said non-magnetic layer flows substantially in
13 perpendicular relation to said non-magnetic layer, and
14 an underlying layer for said free layer provided under said free layer,
15 and said underlying layer for said free layer being in contact with said free
16 layer and said vertical bias layer.
- 1 2. (original) The magneto-resistance effect element according to claim 1,
2 wherein said lower conductive layer has a recessed portion on an upper
3 surface thereof, and said vertical bias layer is provided so as to allow at least
4 part thereof to be buried in said recessed portion.

01FN046US
Amendment dated 09/22/2003

09/916,529

02230028aa
Reply to office action mailed 06/23/2003

1 3. (original) The magneto-resistance effect element according to claim 1,
2 wherein at least part of said free layer is in direct contact with said vertical
3 bias layer.

4. (canceled)

1 5. (currently amended) The magneto-resistance effect element according to
2 claim 1, further comprising a vertical bias layer protective layer provided on
3 said vertical bias layer, and said vertical bias layer protective layer is being in
4 contact with said vertical bias layer, and said vertical bias layer protective
5 layer is being in contact with layer at least one of said free layer and said
6 Underlying underlying layer for said free layer.

1 6. (currently amended) A magneto-resistance effect element comprising:
2 a lower conductive layer;
3 a magnetic layer provided on the lower conductive layer;
4 a free layer provided on the magnetic layer and having an orientation
5 of magnetization varied by a magnetic field coupled magnetically to the
6 magnetic layer and applied thereto;
7 a non-magnetic layer provided on the free layer;
8 a fixed layer provided on the non-magnetic layer and having a pinned
9 orientation of magnetization; and
10 a vertical bias layer, provided on said lower conductive layer, for
11 applying a magnetic field to said free layer, and said magnetic layer is greater
12 in length in the direction of a magnetic field applied thereto by said vertical
13 bias layer than said free layer, and a sense current for detecting a change in
14 electrical resistance of said non-magnetic body layer flows substantially in
15 perpendicular relation to said non-magnetic layer, and

B1
cont

Sub D3
cont

01FN046US
Amendment dated 09/22/2003

09/916,529

02230028aa
Reply to office action mailed 06/23/2003

B1
Cncl.
Sub 3
Cncl.

16 an underlying layer for said free layer provided under said free layer,
17 and said underlying layer for said free layer being in contact with said free
18 layer and said vertical bias layer.

1 7. (original) The magneto-resistance effect element according to claim 6,
2 wherein said magnetic layer is magnetically coupled to said free layer by anti-
3 ferromagnetic coupling or ferromagnetic coupling.

1 8. (original) The magneto-resistance effect element according to claim 6,
2 wherein said lower conductive layer has a recessed portion on an upper
3 surface thereof, and said vertical bias layer is provided so as to allow at least
4 part thereof to be buried in said recessed portion.

1 9. (original) The magneto-resistance effect element according to claim 6,
2 wherein at least part of said free layer is in direct contact with said vertical
3 bias layer.

Claims 10-63. (canceled).